Training Courses in Support of GEN-IV Development – The Case of SVBR Technology

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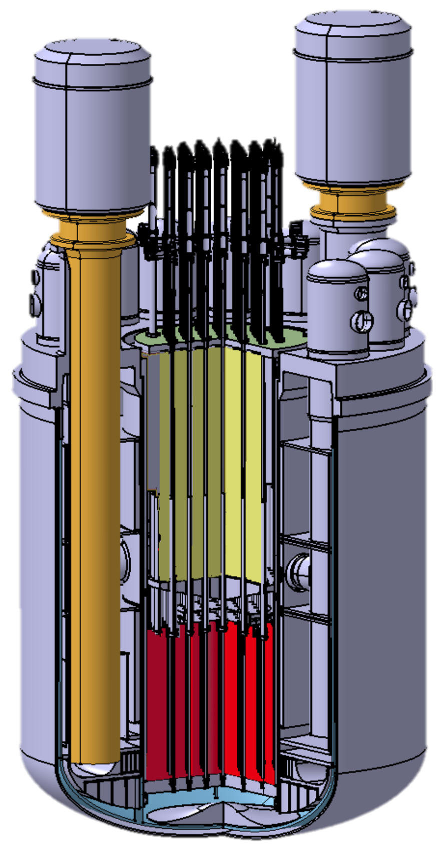
SVBR – 100 Basic Features

ADVANCED SAFETY

- Inert to water and air lead-bismuth coolant with a very high boiling temperature (1670 °C)
- Integral nuclear system design without high pressure in primary circuit
- Passive safety systems
- Any radiological emergency possible for SVBR reactor could not lead to radioactive emissions into the atmosphere
- No hydrogen is released during SVBR operation
- Reduced “single-shaft” risk (through larger number of small units)

SUSTAINABILITY

- Possibility to work in closed nuclear fuel cycle systems



BROAD APPLICATION

- Electricity supply
- Heat supply
- Desalinated water
- Steam supply to industrial needs

ECONOMICAL EFFICIENCY

- Factory-made ready-for-installation reactor module transportable by rail ways, vehicles or sea
- Flexibility for local energy needs due to scalable modular design (100-200-300-400-500-600 MWe)
- Possibility of deployment near residential area
- Relative ease of system integration (fewer requirements to local infrastructure)

Multi-Purposes Application of Reactor Unit

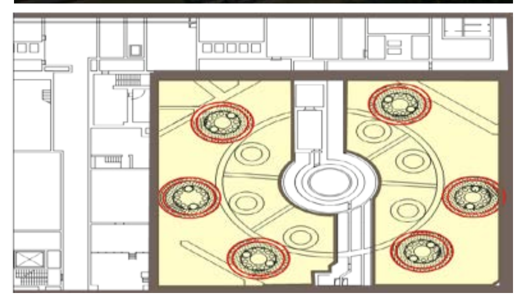
Construction of regional small and medium NPP and NCP allocated close to the cities and energy-intensive industries, including sites in developing countries that do not have complex power grids for electricity transmission and distribution (developing coutries) and in remote areas also.

Example of possible allocation	Industry
Construction of terminals, port “Taman" (Krasnodarsky region)	Transportation
Oil and gas and chemical complex (Primorsky kray.)	Oil & Gas
Zheleznorudniy Ore Mining and Processing Industrial Complex (Buryatiya)	Metal industry
“Peschanka” gold-copper field development (Chukotsky region)	Mining

Construction of high capacity modular NPP for large / centralized energy systems, with a gradual build-up of the installed capacity

Example of allocation of a 4-module SVBR-100 NPP on a single compound

Renovation of retired NPP units . Renovation activities **minimize the unit** capital costs two fold as compared with the construction of new capacities.



Example of possible renovation of VVER-440 units

The concept of **coastal desalination nuclear power complex** comprising two types of onshore desalination plants (multi-layered distillation and reverse osmosis).

Example of an onshore desalination complex.

Construction of Pilot NPP with SVBR-100

Prototype nuclear plant is to be constructed in Dimitrovgrad, Ulyanovsk region near the Russian State Atomic Reactor Research Institute

EVENTS BEHIND:

- Public hearing
- Authorized site (signed rental agreement)
- Signed collaboration agreement between Dimitrovgrad government

NPP KEY PARAMETERS:

- Co-generation mode
- Installed electric capacity: 100 MW(e)
- Heat capacity: 100 Gcal/h
- Efficiency factor: ~36%
- Working time: 50 years
- ICUF*: ~90%

HRD Phases for NPP Operating Personnel (General Requirements in RF)

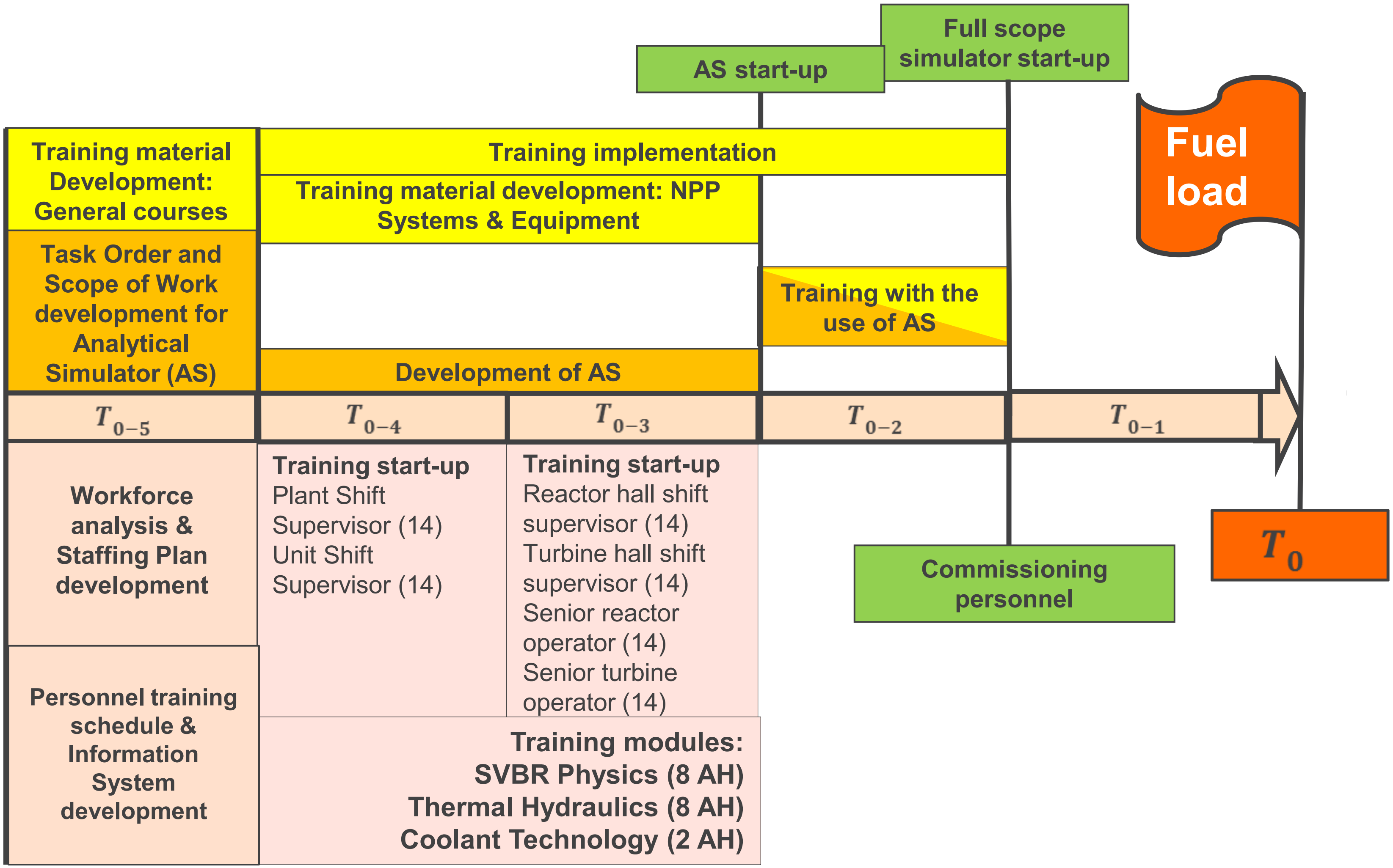
NPP - site

- Independent work admission
- Obtaining a permit
- Duplication
- Examination
- On-the-job training

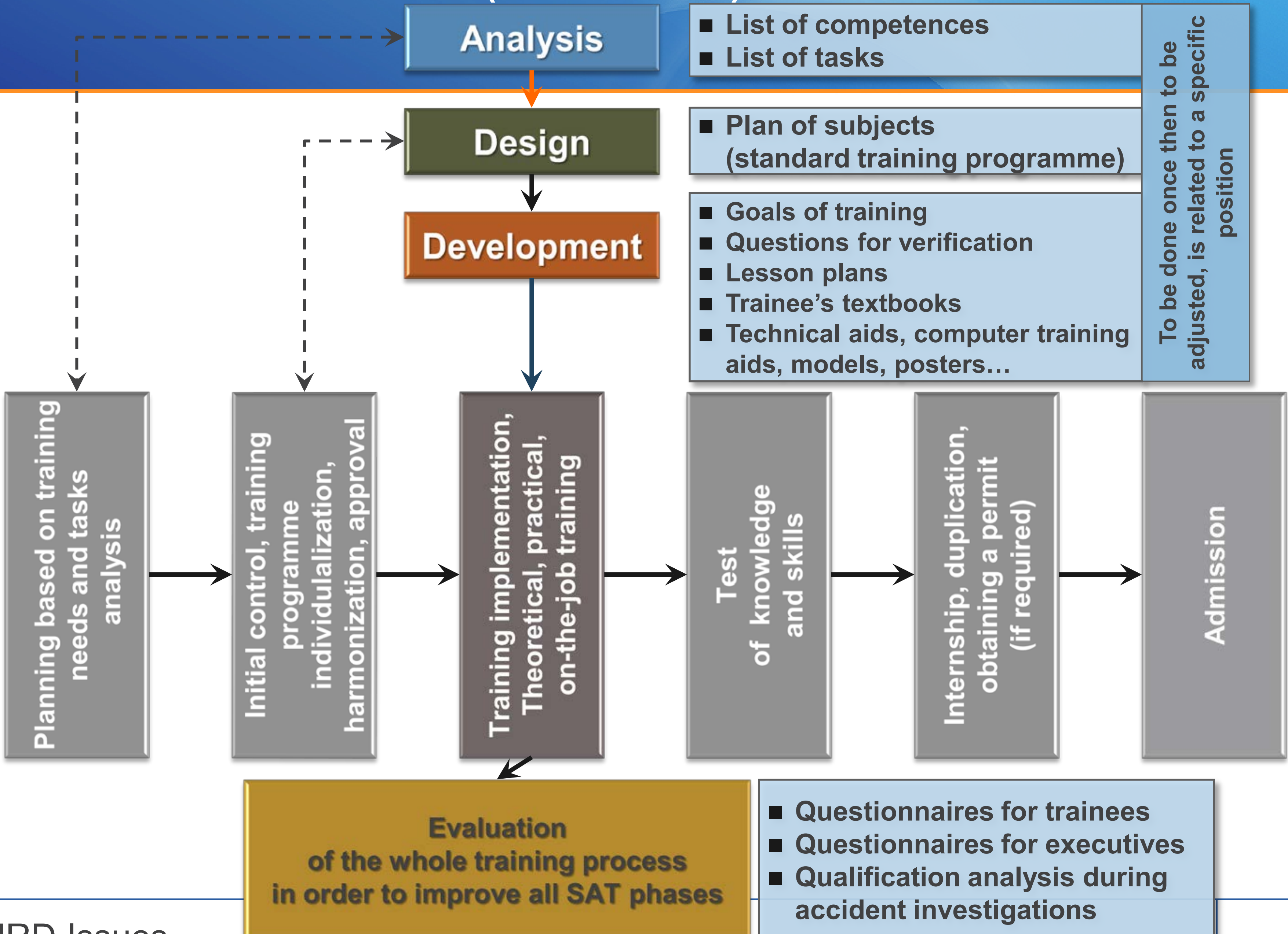
Training centers

- Practical training (Analytical simulators, etc.)
- Theoretical training

Road Map of SVBR-100 Implementation& HRD Issues



Phases of Training Course Development
(based on SAT)



First International Training Course Focusing SVBR technology (October 2013)

Challenge of Training to Support Implementation of SMRs

According to the **IAEA** estimates, the world demand for small and medium-sized reactors (100-400 MW) by year 2040 will be about to 500-1000 plants. The aggregate capacity of this market segment is evaluated as – 600 billion US $. SVBR is considered as a promising candidate to meet this international market.

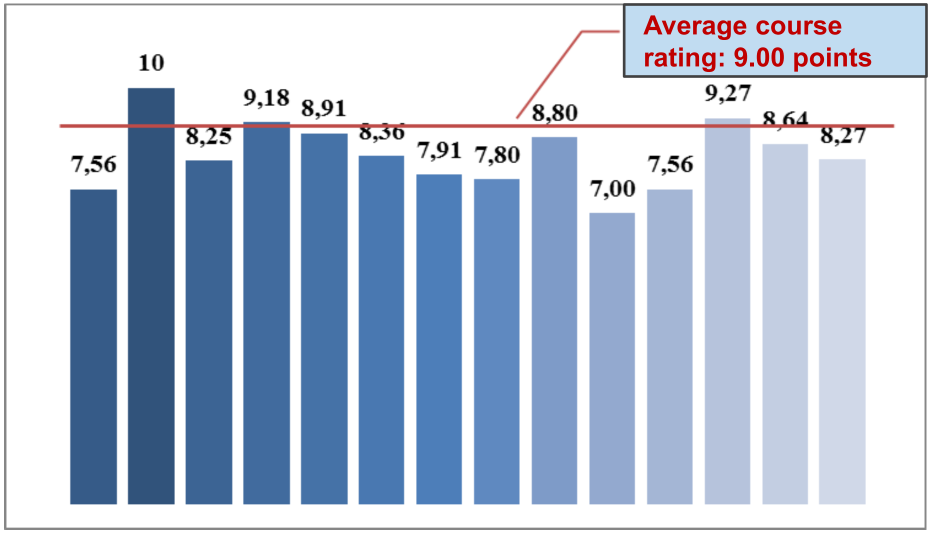
To prepare for this, 07.06 2011 CICE&T hosted Special International Workshop on The Development of Curricula for Training of Foreign Specialists in Russian SMR technology

The Workshop was attended by the representative from IAEA Dr. M. Hadid Subki. Technical Lead, SMR Technology Development. Division of Nuclear Power, Department of Nuclear Energy, the representative from **Singapore Energy Studies Institute** Mr. Hooman Peimani (Head, Energy Security & Geopolitics).

Training Course Schedule

No	Training modules	Ac. Hours
1	Potential of SVBR Technology in Sustainable Power Development	4
2	SVBR Reactor Core Physics	8
3	SVBR Heat Transfer	8
4	Coolant Technology	2
5	SVBR Operation&Contol (Practice with Analytical Simulator)	4
6	SVBR HRD Issues	8
7		34

Training Course Evaluation



Number of International Participants										
Russia	Indonesia	Malaysia	Belgium	Italy	China	Turkey	Czech Rep.	Slovakia	Finland	Singapore
7	3	1	1	2	2	1	2	2	1	1

Conclusions

- For prototype nuclear power reactor the development of training materials requires high level expertise from the R&D side

- The First International Course focusing the SVBR technology was developed and piloted in ROSATOM Central Institute for Continuing Education&Training to support HRD for Open Joint-Stock Company «AKME-engineering» - owner and operator o SVBR-100

- The Course is available for international participants. Please contact

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Thank you for Your attention!